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Articles Section

The Pedagogical Coordinator, the Analysis and Redesign of Mathematical Tasks from a Formative Study Group

O Coordenador Pedagógico, a Análise e o Redesenho de Tarefas Matemáticas a partir de um Grupo de Estudo Formativo

El Coordinador Pedagógico, el Análisis y Rediseño de Tareas Matemáticas a Partir de un Grupo de Estudio Formativo

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Abstract

This article is part of a dissertation and aims to investigate the criteria mobilised by pedagogical coordinators before and after a study group conducted within the scope of the study cycle and task design (SCTD). The data were produced in the formative meetings in which the coordinators first analysed a sequence of tasks and proposed redesigning them. Afterwards, they studied the didactic suitability criteria (DSC) and the task design criteria (TDC), reanalysed them, and refined the previously made redesigns. The research is qualitative, interventional, and collaborative in nature. Data were analysed in light of the DSC and TDC. The results showed that, after the course, the coordinators carried out a more coherent and critical analysis, identifying the weaknesses in the tasks presented to them and suggesting redesigns to improve them.

Keywords: Criteria of didactic suitability. Continuing education. Mathematics education.

Resumo

Este artigo é parte de uma dissertação e objetivou investigar critérios mobilizados por coordenadores pedagógicos antes e após um grupo de estudo realizado no âmbito do Ciclo de Estudo e Desenho de Tarefas (CEDT). Os dados foram produzidos nos encontros formativos em que primeiramente os coordenadores analisaram uma sequência de tarefas e propuseram redesenho para elas. Na continuidade, estudaram os Critérios de Idoneidade Didática (CID) e os Critérios de Desenho de Tarefas (CDT), reanalisaram e refinaram os redesenhos feitos anteriormente. A pesquisa é qualitativa de natureza interventiva e colaborativa. Analisaram-se os dados à luz dos CID e CDT. Os resultados evidenciaram que, após a formação, os coordenadores realizaram uma análise mais coerente e crítica, identificando as fragilidades das tarefas que lhes foram apresentadas e sugerindo redesenhos capazes de melhorá-las.

Palavras-chave: Critérios de Idoneidade Didática. Formação continuada. Educação Matemática.

Resumen

Este artículo forma parte de una disertación y tuvo como objetivo investigar los criterios utilizados por coordinadores pedagógicos antes y después de un grupo de estudio realizado en el marco del Diseño de Tareas y Ciclo de Estudio (TDC). Los datos se recopilaron durante sesiones de capacitación en las que los coordinadores analizaron primero una secuencia de tareas y propusieron rediseños para ellas. Posteriormente, estudiaron los Criterios de Adecuación Didáctica (CID) y los Criterios de Diseño de Tareas (CDT), reanalizando y refinando los rediseños realizados previamente. La investigación es de naturaleza cualitativa, intervencionista y colaborativa. Los datos se analizaron a la luz del CID y el CDT. Los resultados mostraron que, después de la capacitación, los coordinadores realizaron un análisis más coherente y crítico, identificando las debilidades de las tareas presentadas y sugiriendo rediseños capaces de mejorarlas.

Palabras clave: Criterios de Idoneidad didáctica. Formación continua. Educación Matemática.

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1. Introduction

Guiding teacher planning is one of the many functions of a pedagogical coordinator. It is the pedagogical coordinator's role to ensure that teachers assign good tasks to their students: varied in type and nature, at an adequate cognitive level, in accordance with the official and local curricula, etc. (Gusmão, 2019). There is no doubt that this requires adopting criteria, as the task must show its intentionality; thus, the teacher must carefully plan it to achieve their expected learning objectives. When we talk about criteria, we are referring, theoretically and methodologically, to the didactic suitability criteria (DSC) (Breda; Font; Lima, 2015) and the task design criteria (TDC) (Gusmão, 2019).

Such criteria are useful at different times in the teaching and learning process, and, among other situations, they guide the selection, analysis, and redesign of tasks to ensure that students are presented with good tasks. Thus, coordinators and teachers need to master those criteria, as they offer the possibility of an adequate pedagogical practice capable of leading students to effective learning.

On the other hand, mastering those criteria requires study, dialogue, and training, so that pedagogical coordinators can better guide their teachers' work. Concerning the education process, the weaknesses evidenced in the education of undergraduate students in Pedagogy —whether to act as pedagogical coordinators (Santana; Gonçalves, 2020) or to work with specific mathematics knowledge (Coelho Filho; Ghedin, 2018)— must be addressed. Agreeing with Carpes e Bisognin (2021) on the need for continuing education to qualify teachers in teaching and learning processes, a study group was formed with pedagogical coordinators working in the first grades of elementary school to study and discuss DSC and TDC as criteria for analysis, selection, and redesign. The aim was to use a specific mathematical object, perimeter and area, to better guide the teacher's work, and to propose the redesign of tasks, understanding that this process is a space for dialogue, work, and reflection of praxis with the potential to overcome gaps.

This study seeks to contribute to the production of scientific knowledge in the area of mathematics education and to the discussions on the education of pedagogical coordinators and teachers. To this end, we ask: What criteria do pedagogical coordinators mobilise before and after a formative study group when analysing and redesigning tasks? We aimed to conduct a comparative study of the criteria used by the pedagogical coordinators in the analysis and redesign of tasks before and after the formative study group.

2. The initial education of the pedagogical coordinator

The pedagogical coordinator is a central figure in the teaching and learning process of any teaching unit, responsible, among other functions, for organizing and guiding pedagogical work, including teachers' continuing education (Vasconcellos, 2019).

Some of the functions that are the responsibility of the pedagogical coordinator are recommended in Law N. 9.394 of December 20, 1996 (Brasil, 1996), the Law of Guidelines and Bases of National Education (Lei de Diretrizes e Bases da Educação Nacional — LDB), in its art. 64: "[...] management, planning, inspection, supervision, and educational guidance for basic education". This article also states that this professional's education "will be done in undergraduate courses in pedagogy [...]" (Brasil,

1996). According to *CNE/CP Resolution* No. 1, of May 15, 2006 (Brasil, 2006), art. 4, the "Pedagogy degree course is intended for the education of teachers to perform teaching functions in early childhood education and in the early years of elementary school [...]", thus, both the pedagogical coordinator and the multipurpose teacher have their education ensured in the Pedagogy degree.

Researchers such as Pereira (2019), Coelho Coelho Filho e Ghedin (2018), and Nacarato (2017) have identified gaps in the education of this professional in the teaching of mathematics and, consequently, in the pedagogical coordinator's role in guiding the teacher's work in this subject.

According to Coelho Coelho Filho e Ghedin (2018, p. 5), in addition to mathematics being a complex subject to teach, the teacher who teaches it in the early years also lacks "an epistemological deepening to support not only his or her what-to-do, but also his or her how-to-do it pedagogically". Pereira (2019), in analyzing how teachers in the early years manage mathematics, identifies teachers' limited mastery of mathematical knowledge and indicates that, in some cases, they fail to teach content they do not master. Nacarato (2017, p. 776) points out that "teachers in the early years generally do not like mathematics and often bring deep negative marks with this subject".

Another point to consider is pedagogues' vision of their own education and preparation for teaching mathematics. In her research, Lima (2011) found that pedagogues consider that: the education offered to work with mathematics is fragile; there is no focus of study on the contents of the curriculum of the early years; the priority is on methodological aspects; the workload for the study of mathematics is insufficient; and there is little articulation between theory and practice.

Researchers and graduates from the Pedagogy course agree that the Pedagogy licenciates' education is a priority, especially regarding the mastery of mathematical knowledge and their preparation to act as pedagogy professionals, able to deal with issues of professional guidance and continuing education of their teachers (Santana; Gonçalves, 2020). Thus, "[...] such deficiencies must be remedied as a condition for these professionals to rework and restructure their pedagogical practices; in this sense, we believe that initial and continuing education can help minimize this problem" (Coelho Filho; Ghedin, 2018, p. 11).

We agree with these authors and believe that the study and continuing education processes, grounded in theoretical criteria that promote and guide reflection on coordinators' practices in search of improvement, are also spaces to overcome gaps.

3. Criteria for analysis, design, and redesign of tasks

It is necessary to examine the tasks to be taken into the classrooms with criteria, as they directly affect learning and the type of competence to be developed by students.

So,

> [...] tasks that require the performance of a memorized procedure, routinely, lead to a type of opportunity for the student to think. On the other hand, those that require engagement with concepts and that stimulate the establishment of connections lead to a different set of opportunities. Therefore, different tasks constitute diverse learning opportunities. Some have the

> potential to foster complex thought forms in students, while others do not (Cyrino; Estevam, 2023, p. 2).

The task, in this research, is conceived as the teacher's work proposal for the student. It can be of the following types: exercises, experiences, games, problems, investigations, synthesis activities, etc. Moreover, it can be open in nature, *admitting several answers, or closed, admitting a single answer* (Gusmão, 2019).

The different types of tasks allow students to learn different things. Thus, routine exercises that require training and route learning of calculations and formulas help students develop memorization and skills, but probably do not assist them in developing argumentation or creating strategies; however, investigations, games, and projects do. Therefore, the selection, design, or redesign of tasks must take into account the type of learning students should acquire, their prior knowledge, the curriculum, and other factors. In short, they should not be random acts; it is necessary to adopt consensual criteria such as DSC and TDC.

The TDC, shown in Chart 1, is a set of references primarily for didactic planning that guides the selection, initial analysis, design, and redesign of mathematical tasks. These criteria have a heuristic and projective character, helping teachers and pedagogical coordinators to reflect, *a priori*, on the formative potential of the tasks and their cognitive, interactional, and creative characteristics (Gusmão; Font, 2020). The studies by Gusmão e Font (2020) show that TDCs play a central role in the problematization of existing tasks and in the elaboration of proposals that are more consistent with the learning objectives. These criteria are based on the DSCs.

Chart 1 – TDC and indicators

Criteria (TDC)	Analysis indicators
Task nature	Type of task (exercise, problem, investigation, game, project); pedagogical purpose; adequacy to the learning objective
Cognitive requirement	Level of complexity; demand for reasoning; need for conceptual connections; overcoming simple memorization
Typology	Reproduction, connection or reflection tasks; diversity of approaches
Openness of thought	Possibility of multiple strategies and responses; encouragement of argumentation and decision-making
Interactivity	Promotion of interactions between students; collaborative work; mathematical dialogue
Challenge	Degree of intellectual challenge; balance between accessibility and complexity
Attraction, fun, and inclusion	Student engagement; playfulness; respect for diversity
Creativity, originality, and authenticity	Non-stereotyped proposals; stimulation of the creation of one's own strategies; significant contextualization

Source: Adapted from Gusmão (2019) and Gusmão e Font (2020).

In addition, the DSCs presented in Chart 2, integrate the normative dimension of the onto-semiotic approach to mathematical knowledge and instruction (OSA) (Godino, 2024). The DSC constitutes an articulated system of criteria that allows for the evaluation of the quality of teaching and learning processes, considering not only the task itself but also its articulation with the mathematical content, students, resources, interactions, and the institutional context. These criteria are organized

into six facets, epistemic, cognitive, affective, interactional, mediational,[1] and ecological, that guide the identification of weaknesses, the justification of changes, and the proposition of reasoned improvements.

Chart 2 – DSC, facets, and indicators

Facets of didactic suitability	Analysis indicators
Epistemic	Mathematical correction; adequacy to the curriculum; conceptual richness; coherence between concepts, procedures, and representations
Cognitive	Adequacy to student development zones; consideration of prior knowledge; conceptual progression
Affective	Motivation; interest; attitudes towards mathematics; reduction of anxiety; appreciation of error
Interactional	Quality of teacher–student and student–student interactions; promotion of mathematical dialogue; active participation
Mediational (from media)	Proper use of material and technological resources; didactic time; organization of spaces
Ecological	Articulation with the institutional context; coherence with the pedagogical project; real implementation conditions

Source:: Adapted from Godino (2024).

Several studies have used the DSC to analyze mathematical tasks, textbooks, lesson plans and/or reflect on the teacher's didactic-mathematical knowledge (Braga; Santos-Wagner, 2021).

While the TDCs predominantly act in the design and redesign of tasks, the DSCs enable a global assessment of the didactic suitability of the educational-instructional process. Both sets of criteria are articulated in a complementary way, constituting a powerful reference because they allow the subjects involved in the formative process —in this research, pedagogical coordinators— to expand their capacity for critical analysis of tasks and reflection on pedagogical practice before and after the training process.

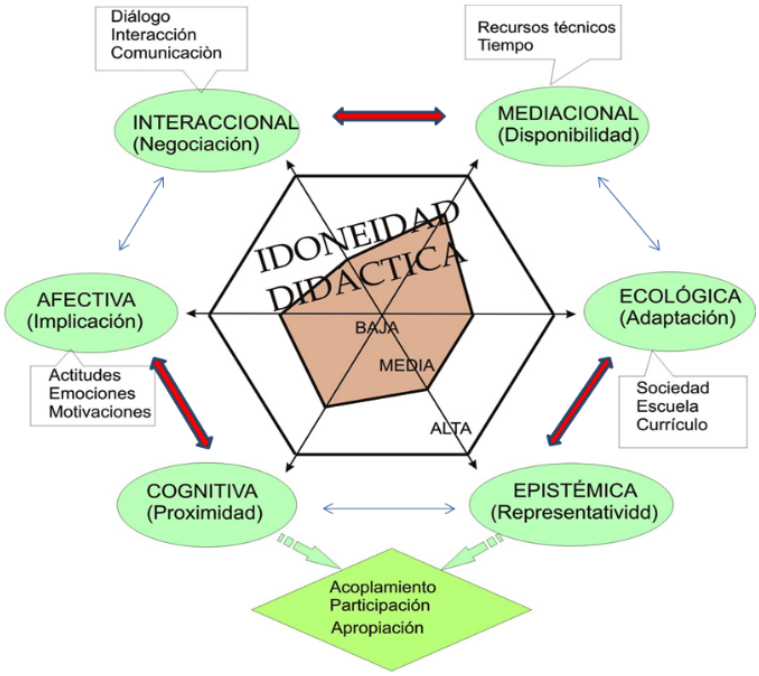
Within a didactic planning framework, which involves the selection, analysis, design, implementation, evaluation, and redesign of mathematical tasks, we seek a balanced articulation among the different facets of didactic suitability to achieve a high degree of adequacy for the educational-instructional process as a whole. This articulation presupposes not only the isolated consideration of each facet, but, above all, the dynamic interaction between its indicators, allowing an integrated reading of the quality of teaching and learning. This conception is symbolically represented by the regular hexagon, shown in Figure 1, in which the epistemic, cognitive, affective, interactional, mediational, and ecological facets are balanced.

However, as Breda, Font, and Breda, Font e Pino-Fan (2018) point out, it is not always possible to reach equally high levels in all facets of didactic suitability, since the teaching and learning process is conditioned by multiple factors of an institutional, curricular, temporal and human nature, many of which are not under the direct control of the teacher or the educator. In these situations, the graphic representation of suitability takes the form of an irregular hexagon, as illustrated in Figurea 1, which shows asymmetries among the facets and allows the identification of specific weaknesses and tensions

[1] In our Portuguese language, it is translated as "de meios". Throughout the text, we will use "mediational"as presented in the literature that supports this study.

in the educational-instructional process, thereby supporting reasoned decisions regarding intervention, adjustment, and task redesign.

Figura 1 – Components of the facets of didactic suitability



Source: Godino (2011, p. 6)

4. Methodological trajectory

This study was approved by the Research Ethics Council (Opinion 3.821.217). It is *qualitative* research with *interventional and collaborative* modalities. Interventional, since we propose, in addition to modifying concrete reality, the production of scientific knowledge (Teixeira; Neto, 2017); ; and collaborative, since it was developed together with the coordinators and not only about them. As Silva, Cracel e Compiani (2014, p. 461), address, this "happens to and with schools and teachers" and is not "about the school and teachers".

The research context was the schools serving students in the initial years of elementary school in the municipal network of Planaltino (BA), Brazil. The municipality had 11 teaching units, 7 coordinators, and 1,080 students. A coordinator chose not to participate. All coordinators have a degree in Pedagogy and experience in teaching and coordinating the initial years, as shown in Chart 3.

The choice of context and participants is related to the field of action of the researcher (first author) as a teacher and his experience as a pedagogical coordinator previously working in three of these schools, where he witnessed difficulties and anxieties of teachers who teach mathematics in the early years to work on content that they did not master. Such difficulties are corroborated by Pereira (2019), Coelho Coelho Filho e Ghedin (2018), Nacarato (2017), and Lima (2011).

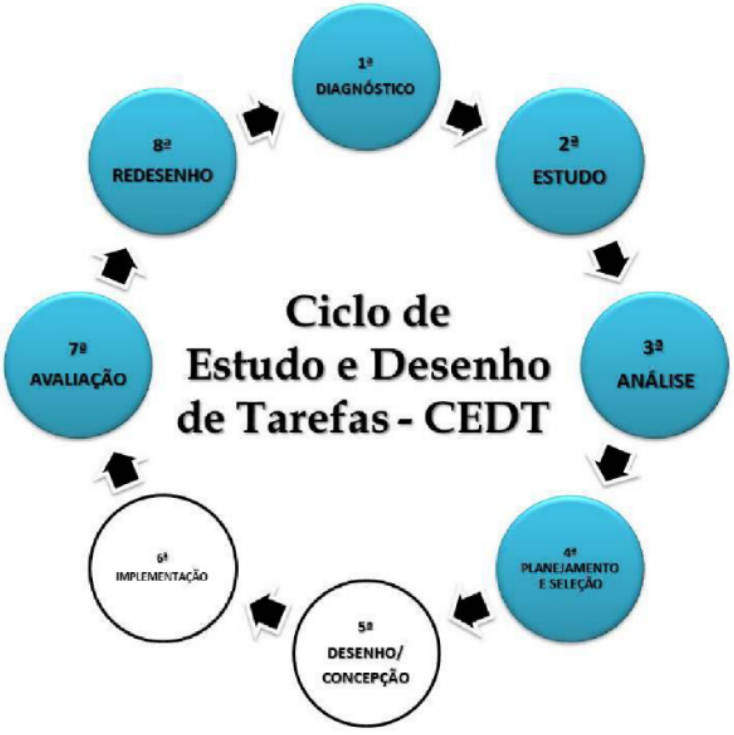
Chart 3 – Characterization of the participants

Participant	Education	Teaching Experience Initial Years	Experience in Pedagogical Coordination
Orquídea	Pedagogy and Specialization in School Management and YAE	6 years	2 years
Margarida	Pedagogy and Specialization in Pedagogical Coordination	11 years	1 year
Rosa	Pedagogy	18 years	4 years
Girassol	Pedagogy	8 years	4 years
Tulipa	Pedagogy and Specialization in Geography and Environment	5 years	2 years
Azaleia	Pedagogy	16 years	4 years

Source: Study data.

We adopted the study cycle and task design (SCTD) as a methodological principle for data production, a study method proposed by Gusmão e Font (2020) that unifies the TDCs and the DSCs. Figure 2 depicts the phases of this cycle, and highlighted are those that were covered in this study.

Figura 2 – Study cycle phases and task design



Source: Elaborated by Gusmão e Font (2020)

As stated by Gusmão e Font (2020), the SCTD is flexible; thus, some steps can be developed simultaneously, since not all phases can be carried out in every investigation. Although our research followed six phases of SCTD, it was organized and developed into four phases, as shown in Figure 3.

Figura 3 – Stages of organization and development of the research

Source: Prepared by the authors.

The diagnostic phase comprised cataloging tasks and administering questionnaires; we then moved on to the task selection phase and the study, analysis, planning, evaluation, and redesign phases contemplated within the formative study group. Next, we present the phases of data production in more detail.

1st stage — Task cataloging: we contacted all coordinators of the municipal network working in elementary school early years, as well as some teachers, to gather as many mathematical tasks as possible that were addressed in 2019.

2nd stage — Application of questionnaires: we administered two questionnaires to the coordinators to identify a thematic unit and, within this, an object of knowledge in which they had more difficulty in guiding the teacher's work.

3rd stage — Selection of tasks: after the questionnaire responses, the *magnitudes and measures of the thematic unit and* the object of knowledge' perimeter and area' were identified as challenging for the coordinators' work in guiding the teachers. Thus, for our study, we selected, from the universe of tasks we had gathered, those that addressed this object of knowledge.

4th stage — Formative study group: this consisted of four modules. *The first module* was held over four virtual meetings totaling 7 h 30 min via Google Meet; these meetings were recorded with the participants' permission. We started by asking the coordinators about the personal criteria they consider fundamental for task planning: selection, analysis, and redesign. Then, they carried out an analysis, evaluation, and redesign process based on personal criteria. To this end, during the meetings, we presented five tasks related to the object of knowledge "perimeter and area". We asked them to analyze them using their personal criteria, classify them as "*poor*", "*regular*", or "*good*", and justify their classifications. Finally, we asked them to suggest modifications based on personal criteria.

In the *second module,* totaling 9 h 30 min, the study of specific themes was carried out: design of mathematical tasks: DSC and measures and quantities — perimeter and area.

The third module, totaling 8 h 30 min, was intended for reanalysis, valuation, and redesign of the tasks, taking **??** as a reference.

For the sake of space, we present, for illustrative purposes only, the adaptations made to the ecological component of didactic suitability. The other adaptations are discussed in the analysis blocks.

Chart 4 – Adaptations for analysis and valuation of the facets of didactic suitability

Analysis and Valuation of Facets					
Indicators		**Yes/ No/ Little**	**Low**	**Mean**	**High**
Ecological	Is the content covered in the tasks in accordance with the official curricula of the institution – BNCC, DCRB, Course Plan, etc.?				
	Do the tasks seek an articulation between different mathematical content and between mathematical content and other subjects?				
	Do the tasks connect the proposed situations to real life and to the community in which the students are embedded?				

Source: Prepared by Breda, Breda, Font e Lima (2015), and Pereira (2019).

The researcher had these same materials to record the process; in addition, the entire discussion was recorded for later analysis. In the reanalysis, the researcher designed a task for the coordinators to analyze from Chart 4, observing each indicator and signalling "yes" when it was contemplated, "no" when it was not contemplated, and "little" when it was partially contemplated. Then, using the indicators, each facet was evaluated as low, medium, or high, thereby identifying the aspects of the tasks that needed redesign. This process was repeated with five tasks, in which the indicators of all facets of didactic suitability were observed. Finally, after the valuation, the coordinators were encouraged to review the facets with low valuations in each task and to consider redesigns that would improve them based on indicators that had not been considered. Thus, in a collective, dialogued manner, the coordinators suggested redesigning the five tasks used in this process.

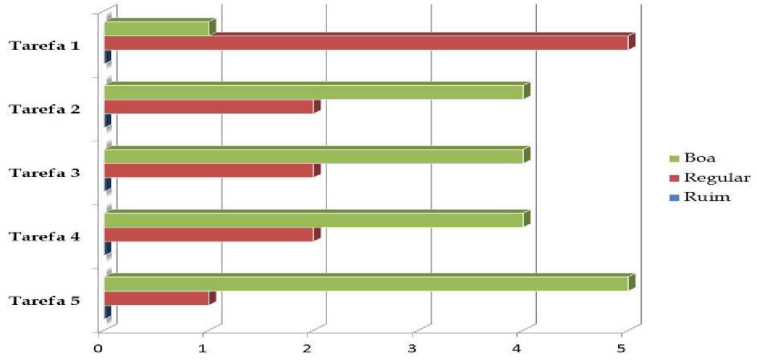
5. Data analysis and discussion

At first, we sought to investigate, before conducting the study group, the criteria used by the pedagogical coordinators to analyze and classify mathematical tasks and how they were mobilized in the redesign of these tasks. For this, we present five tasks[2] aimed at the 4th and 5th grades of the initial years, three related to the measurement of perimeter and two to the measurement of the area of plane figures. We asked them to analyze them based on personal criteria and classify them as "good", for the one totally suitable for use in the classroom, without the need for modification, "regular", when

[2] Tasks that were used by schools in the municipality through the project Aprova Brasil, of Editora Moderna - Project of targeted intervention that aims at the development of skills and competencies evaluated in national exams (Sistema de Avaliação da Educação Básica [SAEB]//Prova Brasil), state and municipal.

suitable for use in the classroom, but in need of modifications, and "poor", for the one they only take to the classroom after making major modifications. The classification results are shown in Figure 4.

Figura 4 – Classification chart of tasks, according to pedagogical coordinators, before the formative study group



Source: Elaborated from the research data.

Of the five tasks, while the first was classified as "regular", the others were considered "good". After this classification, we asked them to suggest redesigns they deemed necessary to make the tasks "good" and to justify their redesign suggestions. Suggestions for redesigns and justifications are presented in Chart 5

Chart 5 – Redesign suggestions before the formative study group

(continua)

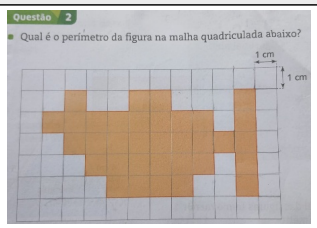
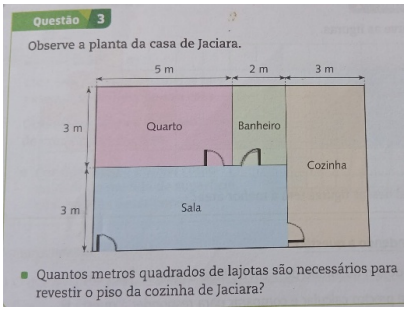
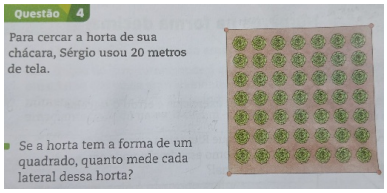
N./Classification	Tasks[a]	Redesign suggestions	Justifications
1 – Regular		1. *Use classroom objects to measure.* 2. *Contextualize the question.*	Not Justified
2 – Good		1. *Contextualize the question.*	Not justified
3 – Good		1. *The very measurement of the classroom area could have been requested.* 2. *Contextualize the question.*	*Use of the manipulative.*

Chart 5 – Redesign suggestions before the formative study group

(conclusão)

N./Classification	Tasks[a]	Redesign suggestions	Justifications
4 – Good		Redesign not suggested	Not justified.
5 – Good		Redesign not suggested	Not justified.

Source: Research data.

Nota: [a] For the sake of space, the tasks were presented without the sections "Understanding the question" and "Answering the question"; such sections can be seen in Figure 6 and are similar in all tasks.

We were struck by the fact that even those who classified the tasks as "regular" offered few redesign suggestions and struggled to justify them. This brought us to the first stage of the formative study group, when these coordinators reported that teachers had difficulties and resistance in redesigning tasks:

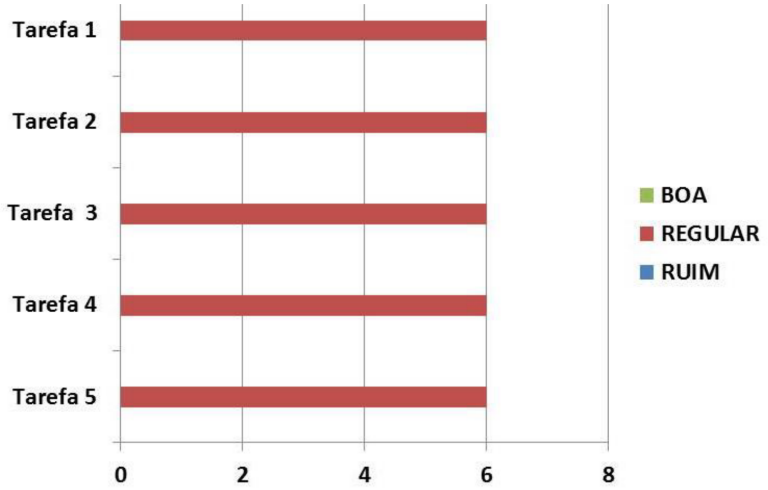
> *One or another teacher created and took them to class, while others did not; they were only in the sameness of the slate and the notebook, slate and notebook, slate and notebook* (Orquídea).
>
> *Some 80% are internet research, and with some changes and little, little creativity, few drawings* (Tulip).
>
> *It is more reproduction than creation* (Margarida).

The coordinators' speeches refer to the teachers, but the results of the first analysis show that the difficulty of redesigning and justifying redesigns is not only for the teachers but also for the coordinators.

Girassol believes that the teachers' difficulty in drawing and redesigning "[...] *is linked to how easily we find pre-prepared activities today. This convenience kind of relaxes you, leaves you comfortable*". To this, we can add the lack of well-defined, theoretically grounded criteria to guide the views of these teachers and coordinators.

After conducting the formative study group, the same tasks were reanalyzed, valued, and classified; redesigns were also suggested, now having the DSC and TDC as parameters. Regarding the classification, if the task presented most of the facets with a "low" valuation, it was classified as "poor"; if the majority was "average", it was classified as "regular"; and, if the majority was "high", it was considered "good". The results are shown in Figure 5 below.

Figura 5 – Classification of tasks after formative study group



Source: Elaborated from the research data.

The results show a change in classification. While in the first analysis (before the formative process) only one task was considered "regular" and the others "*good*", in the reanalysis, all were classified as "regular". This change is due to discussions in the study group, as evidenced by the coordinators' statements when asked about the group's contribution to their practices.

> *I particularly liked it because it gave me a greater direction to be able to analyze the activities. Because until then I analyzed, but I did not have this business in mind, I did not have criteria to be able to analyze the activities definitively* (Tulipa).
>
> [...] *some activities that I looked at and said like them, wow, this activity is oh nice and smooth!" And that in the analysis of the activity, now, I said: How do students manage to handle this task? That's so boring, guys!* (Girassol).

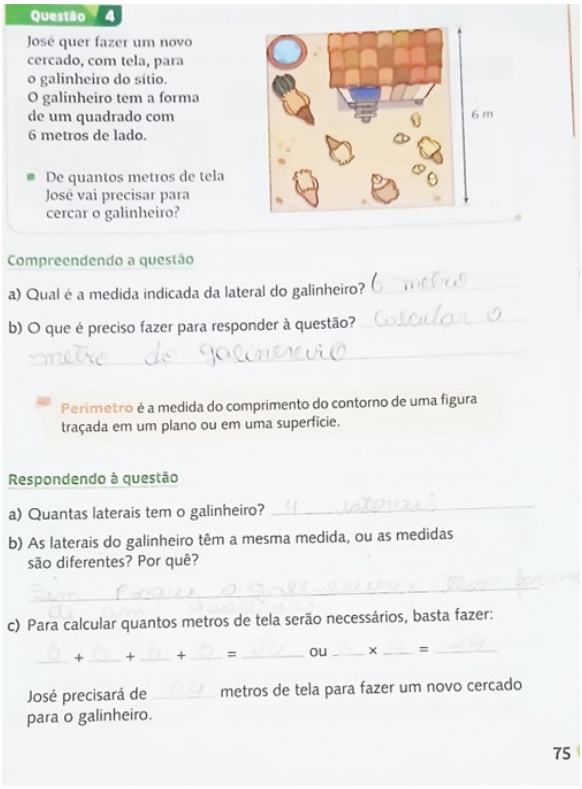
The reanalysis and valuation of the tasks based on the studied criteria showed that they present problems mainly in the affective facets, where three of the five tasks were valued as "low"; and in the mediational facets, where all five were valued as "low".

In the reanalysis, indicators of the affective facet of *argumentation between students or between the teacher and the students were not included, nor were indicators of how attracted students were to tasks, as well as diversification, challenges, and fun, to the point of promoting self-esteem and a taste for mathematics* (Gusmão; Font, 2020).

Also, the indicators of the mediational facet of the *use of manipulative materials (tangram, logical blocks, geoplane, etc.) and/or technological to assist in the realization were not contemplated; the moments of practical realization – problem situations, models and visualizations – to assist in the understanding of concepts and applicability; and the use of conventional (ruler, meter, tape measure, etc.) and unconventional (string, toothpick, palm, etc.) instruments.* Thus, during the redesign process, the coordinators were encouraged to review these indicators and suggest redesigns.

One of the tasks analyzed and redesigned is presented in Figure 6. We chose to present this task by the contrast evidenced in the classification and redesign suggestions before and after the formative study group.

Figura 6 – Chicken coop perimeter



Questão 4

José quer fazer um novo cercado, com tela, para o galinheiro do sítio. O galinheiro tem a forma de um quadrado com 6 metros de lado.

- De quantos metros de tela José vai precisar para cercar o galinheiro?

6 m

Compreendendo a questão

a) Qual é a medida indicada da lateral do galinheiro? 6 metros

b) O que é preciso fazer para responder à questão? Calcular o metro do galinheiro

Perímetro é a medida do comprimento do contorno de uma figura traçada em um plano ou em uma superfície.

Respondendo à questão

a) Quantas laterais tem o galinheiro? 4 laterais

b) As laterais do galinheiro têm a mesma medida, ou as medidas são diferentes? Por quê?

Sim, pois o galinheiro tem forma de quadrado.

c) Para calcular quantos metros de tela serão necessários, basta fazer:

6 + 6 + 6 + 6 = 24 ou 4 × 6 = 24

José precisará de 24 metros de tela para fazer um novo cercado para o galinheiro.

75

Source: Aprova Brasil[3]: matemática: ensino fundamental: anos iniciais. 4º ano, (2016), p. 75.

Before the study group, one of the six coordinators classified this task as "regular", but did not justify or suggest modifications. The other coordinators classified it as "good" and considered the changes unnecessary. After the groups' formative process, this task was classified as "regular", and all groups suggested alterations. As the task had the mediational and affective suitability classified as "low", suggestions were made for redesigns to improve them:

> Girassol: *We could ask them [students] to think about their house or, in the case of my reality here [urban area], their grandparents' house or the chicken coop, how their house would be, for them to draw theirs. And I could ask them to use the same measures presented in the task or think of other possible measures, because we can find them in the students' grandparents' house in a form other than a square. I think it would allow them to think beyond what is put there.* (Excerpt from the 3rd phase of the formative study group. 01:09:03 – 01:10:10).
>
> Orquídea: *We could visit one student's home with a chicken coop, observe and measure, and visit the house of a student where the chickens sleep in a tree. Upon returning to the classroom, this could foster a strong debate because they would have to measure the tree's canopy. How would they proceed?* (Excerpt from the 3rd phase of the formative study group. 01:12:33 – 01:14:15).

The suggestions presented include the indicators of affective suitability related to the *argumentation processes* and the fact that the task is *fun and challenging* (Gusmão; Font, 2020)*; and work with non-polygonal figures,* especially when it is proposed to measure the perimeter of the canopy of the tree that shelters the chicken, since all tasks presented only polygonal figures. Many student inquiries could arise from this. How to proceed to make this measurement? Which instrument to use? Regarding mediational suitability, the suggestion includes indicators related to the *use of manipulative materials;*

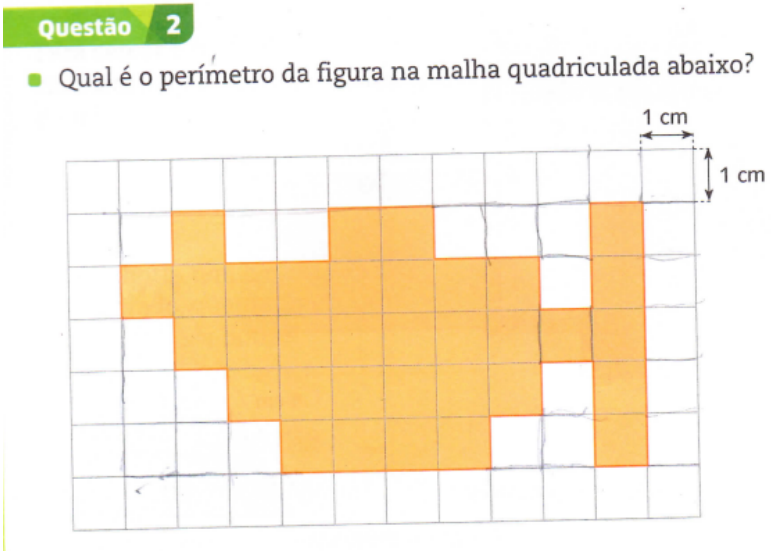
[3]Aprova BRASIL is a targeted intervention project that aims at the development of skills and competencies evaluated in national exams (Sistema de Avaliação da Educação Básica [SAEB]/Prova Brasil), state and municipal.

the practical realization to assist in the understanding of concepts and applicability; the requirement of different calculation strategies; and the use of conventional and unconventional instruments for measurement and estimation (Godino, 2011).

Moreover, these suggestions contributed to leveraging the classification of suitability: cognitive, because, as it is a practical situation, it allows the more effective inclusion of all students, regardless of their difficulties; epistemic, by requiring students to calculate the perimeter of non-polygonal "figure" (the perimeter of the tree canopy); and interactional, favoring dialogue between students, these with the teacher and contemplating moments of autonomy in which students need to be responsible for their own study thinking about strategies, materials, etc (Godino, 2011).

Another task widely discussed in the redesign suggestion is the one presented in Figure 7.

Figura 7 – Perimeter in the mesh



Source: Aprova Brasil. matemática: ensino fundamental: anos iniciais. 5º ano, (2016), p. 73.

This task had low valuation in affective, mediational, and interactional suitability. The coordinators had a hard time suggesting redesigns to improve this suitability, as shown in the following statements: "*I did not like this activity, so far I have not been able to think*" (Orquídea). "*This is the furthest from the student's reality.*" (Girassol) (Excerpt from the 3rd phase of the formative study group).

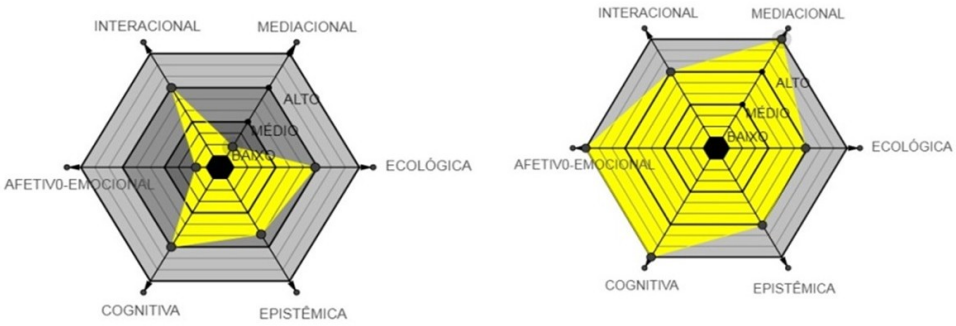
Some of the suggestions for redesigns are presented below:

> Margarida: *I thought about asking the student to measure, make, create their own checkered mesh. The teacher asked for the measurements he wanted, and the student did it. He was going to use a ruler.*
>
> Girassol: *I thought we would start from something that was more present in the student's daily life. The yard, his room...* (Excerpts from the 3rd phase of the formative study group).
>
> Azaleia: *We could ask him to represent the backyard of his house, usually, the children from the countryside all have a backyard at home. Some yards are larger, others are smaller, they may have different shapes. The yards do not have the same perimeters, we would have diversity. In any case, when presenting the results, we would have different results* (Excerpt from the 3rd phase of the formative study group).

The suggestions for redesign converge, for example, to improve affective, ecological, and interactional suitability, because, by suggesting working on the checkered mesh with the measurements of the student's backyard, one can develop students' greater interest, bring the mathematical doing closer to the social environment and favor the processes of dialogues and demonstrations.

A comparative synthesis of analyses and valuations of suitability before and after redesign suggestions is presented in Figures 8.

Figura 8 – Valuation before and after redesign suggestions



Source: Research data, based on Amorin (2017)

The comparative analysis shows that the redesigns suggested by the coordinators, after the formative study group, managed to increase not only the valuation of the suitability classified as "low", but also of the others, thus proving the contribution of the formative course carried out to expand the range of criteria used by the coordinators and guide them in the process of analysis and redesign of tasks.

6. Conclusions

During the analysis and redesign process, the coordinators found it difficult to identify the weaknesses in the tasks. And although their speeches suggest considering, during task planning, criteria related to the DSC, these criteria were little mobilized during the redesign process. Their speeches always pointed out criteria related to the level of challenge of the task (cognitive facet) and the need for contextualization, i.e., the task was relevant to everyday issues, to the student's social environment (ecological facet).

In other words, the coordinators had many difficulties articulating these criteria to identify, in the tasks analyzed, points that needed adjustment, justify the need for adjustments, and propose improvements. This fact leads to the conclusion that such criteria are cited at random and not as guides to the analysis and redesign process or even as "criteria of 'suitability' or adequacy that allow us to evaluate the instruction processes actually carried out and 'guide' their improvement" (Breda; Font; Lima, 2015, p. 4).

The reanalysis done after the formative study group showed significant changes when compared to the first analysis. Participants identified critical points that had previously gone unnoticed (low mediational and affective suitability). As for the redesign suggestions, these were guided by the DSC and TDC criteria and increased not only the suitability valued as "low," but also those already valued as

"average." However, very important criteria, such as typology and the nature of tasks (Gusmão, 2019), were not considered by the coordinators.

We conclude that the formative study group constituted a space for dialogue, the exchange of experiences, and learning, in which the coordinators were able not only to reflect on their practice, but also to resignify it. Implementing the redesign suggestions is a future study perspective to verify whether the improvements obtained remain in classroom practice.

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